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ABSTRACT

Nutrition is well-recognized as a necessary component of educational programs for physicians. This is to be valued in that of all factors affecting health in the United States, none is more important than nutrition. This can be argued from various perspectives, including health promotion, disease prevention, and therapeutic management. In all cases, serious consideration of nutrition related issues in the practice is seen to be one means to achieve cost-effective medical care. These modules were developed to provide more practical knowledge for health care providers, and in particular primary care physicians. This module deals with the nutritional needs and feeding practices of a child between ages 1 and 12. A care study of a typical 4-year-old is used to test the student's knowledge of the nutritional care of a child. Included are the learning goals and objectives, and references for the physician and for the physician to give to the patient. The appendices include growth charts, a chart of triceps skinfolds, a chart of blood group and urine data, a sample nutrient breakdown chart, and a chart of sample listings of vitamin supplements. (CW)

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# 5 Normal Diet: Age of Parental Control

Elizabeth Tuckermanty
Charlette R. Gallagher-Allred

Nutrition in Primary Care

Department of Family Medicine
The Ohio State University
Columbus, Ohio 43210



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# 5 Normal Diet: Age of Parental Control

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# 5 Normal Diet: Age of Parental Control

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## Introduction

Heredity and environment determine the way a child grows and his size and shape. *Genetic inheritance* specifies how much bones will grow and what kind of physique the child will have. *Environment* may encourage or inhibit these genetic possibilities. Adequate nutrition plays an important role in determining whether an individual attains his genetic potential. Nutrition influences the state of health not only during childhood but also throughout life.

Therefore, you need to be knowledgeable concerning the nutritional needs and proper feeding practices of infants and children in order to help the parents of the dependent child maximize his growth potential through good nutrition. This module deals with the nutritional needs and feeding practices of the child between 1 and 12. A care study of a typical 4-year-old is used to test your ability to plan the nutritional care of a child.

## Goals

*As a result of this unit of study, when given a scenario of a 4-year-old, you should be able to:*

1. *Select, from a typical diet history, nutrients consumed at an appropriate level based on the Recommended Dietary Allowances (RDA);*

2. *Select the appropriate kilocalorie level which would be satisfactory for growth, development, and weight maintenance for the child;*

3. *Identify changes in food intake that would improve the child's dietary intake;*

4. *Select two foods from the child's diet history that would increase the intake of iron if provided more frequently; and*

5. *Select actions appropriate for the nutritional care of the child.*

*As a result of this unit of study, you also should be able to:*

6. *Explain to a mother, in simple terms, the concepts of hyperplastic and hypertrophic proliferation of adipose tissue; and*

7. *Identify three nutrients frequently found to be inadequately supplied in the diet of preschoolers.*

## Nutrient Needs and Feeding Practices in Children Aged 1 to 12

### Years 1 to 3

**During the second and third years of life, the child's diet must be balanced with foods in all four food groups. Intake at different times will vary greatly.**

By the time the baby is 1 year old, good feeding practices should already have been established. By this age, the baby's meals probably include milk, cereals, eggs, breadstuffs, butter or fortified margarine, meats, soups, vegetables, fruits, and puddings. Teeth usually have developed, and the selection of food should include foods that will encourage chewing.

During the ages 1 to 3 years, the need for protein for growth of muscles and other tissue is relatively great. These needs are easily met if the toddler consumes a pint of milk and 1 to 2 ounces of meat daily. Although milk is high in protein, unlimited consumption that leads to neglect of other necessary foods should be discouraged. Because the RDA for iron is not easily met with the usual diet at this age, an iron supplement may be necessary. In areas where iodine in the soil is limited, such as northern and Great Lakes states, a small amount of iodized salt in cooking and seasoning will provide the recommended amount of iodine. Foods high in ascorbic acid and vitamin A should be served daily. A vitamin D supplement will be necessary if fortified milk is not used. A varied menu such as that shown in Table 5–1 provides an adequate intake of vitamins if the toddler's appetite permits its consumption.

Compared to the infant, the 1- to 3-year-old

**Table 5–1** Suggested Meal Plan for the 1- to 3-Year-Old

Breakfast
- Fruit or juice
- Cereal with milk
- Toast
- Butter or margarine
- Milk

Lunch
- Main dish including meat, eggs, fish, poultry, dried beans or peas, cheese or peanut butter
- Vegetable or salad
- Bread
- Butter or margarine
- Fruit or pudding
- Milk

Dinner
- Meat, poultry or fish
- Vegetable
- Salad
- Bread
- Butter or margarine
- Fruit or pudding
- Milk

Snacks Between Meals
- Dry cereal, with or without milk
- Plain cookie or cracker
- Raw vegetables
- Canned, fresh or dried fruit
- Cheese sticks
- Fruit sherbet or ice cream
- Toast, plain or buttered
- Fruit juice
- Fruit drinks made with milk or juice

Adapted from *Your Child 1 to 3*. U.S. Dept. of Health, Education and Welfare, Children's Bureau, 1966. Revised 1967; reprinted 1969.

child becomes more selective and more independent about what he eats. Usually by 6 to 9 months, girls and boys decrease their milk intake markedly. For girls, decreased milk intake continues until age 2 to 3, but then milk intake begins to rise. In contrast, boys decrease their milk intake faster than do girls but recover more rapidly; by 2½, boys have reached a higher level of milk intake than girls.

The 1- to 3-year-old period is sometimes difficult for parents because the child's appetite wanes, the rate of growth is slow and irregular, weight often drops, and the child begins to find wider horizons of activity offering greater interests. Desire for food often becomes erratic, and there is a noticeable drop in consumption of food between the second and third years of life. The 1- to 3-year-old may go for weeks or even months without gaining weight. Fascination with testing new motor skills exceeds interest in food. The "won't eat" era is a normal phase of development and is much harder on the parents than the child. If you tell parents that this decline in eating is to be expected, many problems can be avoided. Parents should also by encouraged not to foster poor eating habits by being over-anxious or by bribing the child to eat. During this period, you will often be asked, "Shouldn't we be giving our child a vitamin pill?" You should respond that the decrease in appetite is usually brief and that the child's health is not in danger. However, it is still a good idea to assess the child's nutritional intake before answering the parents' question. If the child's diet is extremely inadequate, the use of a multivitamin and mineral supplement that meet the RDA is temporarily justified. Emphasize to parents that what the child does eat should be as nutritious as possible. Also tell parents that appetite usually tends to improve as the child approaches school age, and an increase in growth and weight is bound to follow.

## Years 3 to 5

**Portion sizes served the 3- to 5-year-old should be about half the size served adults. Colorful and simple foods are well-liked. Snacks and desserts, if served, should be highly nutritious.**

The daily food guide (Table 5–2) serves as the basis of the diet for the 3- to 5-year-old child. Size of servings is about half the average size used for older children and adults. Approximately 3 tablespoons for the 3-year-old and 4 tablespoons for the 4-year-old are good estimates for size of servings at meals. The 3- to 5-year-old should be encouraged to drink 2 to 3 cups of milk (regular or skim) daily. Some of the requirement for milk may be provided in creamed soups and custards or in other desserts included in the child's meals or snacks. The preschooler finds helping to prepare and serve "instant puddings" fun. This is an excellent way to encourage increased milk consumption in this age group.

Two-, three-, and four-year-olds want to identify food. Colorful and attractive foods that are easy to handle as well as eat are appealing to children. Successful eating patterns can be encouraged by an environment which is conducive to enjoying foods and by utensils which make handling food easy. Children of this age prefer simple foods which they can handle as opposed to foods that are puréed, or mixed dishes. Gravies and cream sauces are not popular. Foods such as bite-sized pieces of fruits, vegetables, and meats, ready-to-eat cereals, eggs, cottage cheese, and other mild cheeses are all very good foods to add to the child's diet at this age. Very small portions (1 to 2 Tablespoons) seem to encourage the toddler to eat.

Exclusive eating of a few favorite foods is common with 4- and 5-year-old children. They may want to eat nothing at a particular sitting except peanut butter sandwiches and fruit juice, or 2 to 3 hard cooked eggs. These patterns usually do not persist for very long, and soon they will settle down to normal meals again. Five- and six-year-old youngsters are imitators. During this age, emotional impressions become associated with food; thus aversions to food develop for many reasons. Emotional experiences at the table should therefore be pleasant. When unpleasant associations are aroused by food, they need to be recognized and understood.

Mid-morning and mid-afternoon snacks are important for this age group unless they interfere with food consumption at mealtimes.

Good snacks, which are part of the whole day's meal plan, might include the following:

Dry cereal, with or without milk
Graham crackers or simple unfrosted cookies
Toast, plain or cinnamon
Canned, fresh, or dried fruit
Fruit juice
Fruit drinks made with milk and juice
Raw vegetables
Milk
Cheese wedge
Fruit sherbet or ice cream

Desserts, to be appropriate for the 3- to 5-year-old child, should furnish the essential protein, minerals, and vitamins as well as necessary kilocalories. They should not be given as rewards for finishing a meal nor should they be withheld as punishment for not doing so.

### Years 5 to 12

**School-aged children require the same basic foods as younger children, but require larger quantities. Meals are often arranged around the school schedule. Peers have great influence on a child's eating practices.**

During the early school years, there is a relatively constant increase in food intake. Growth in height and weight is slow but steady. During these early school years, the child may add 10 to 12 inches in his height and 30 to 35 pounds to his weight.

School-age children, 6 to 12, require the same basic foods as when they were younger, but the quantities are increased to take care of their greater needs (see Table 5–2). During this period, energy needs gradually increase and approach those of adults. Mothers learn that the meal schedule must be spaced in relation to the school routine rather than to the child's needs or desires. It seems that eating patterns and attitudes toward food vary daily. Children must decide whether to eat lunch in the cafeteria at school or carry it from home. The decision often rests on the practices of peers. The excitement of school, new contacts, and different routines when approached as new challenges will often help to continue or promote good eating practices and regular meals. When children are eating at home, mothers should plan sufficient time for eating all meals, including an adequate breakfast.

Teachers and peers, especially, influence the school-age children's selection of foods. They prefer meat, potatoes, bread, crackers, milk, ice cream, cereals, and raw fruit; they tend to dislike fat meat, fish, cooked vegetables, cheese, and mixed meat and egg dishes. Because intake of protein, calcium, vitamin A, and ascorbic acid is apt to be low, mothers should plan after-school snacks and dinners rich in these foods. Spaghetti and meat sauce, pizza, and macaroni and cheese are well liked by school-age children and are good sources of protein, calcium, and vitamin A. Coupled with fruits and raw vegetables, these foods combine to make a nutritious dinner.

By age 6 or 7, children are willing to try new foods and to accept foods previously disliked. By age 8, they have a ravenous appetite and refuse few foods; however, strong preferences are common. By age 9, children usually have a keen interest in foods; they like to help prepare food and are positive in likes and dislikes. The 9-year-old still prefers plain foods. The 10- to 12-year-old usually eats well and enjoys a variety of foods. See Table 5–2 for foods which should be included in this later elementary school-aged child's diet. Note the difference in recommended portion sizes for various age children.

## Care Study

Mrs. Wilson is in your office with her 4-year-old daughter, Jenny, for a preschool checkup. The child appears sulky and pale. You look at her laboratory reports taken earlier in the week and find the following:

| | |
|---|---|
| hemoglobin: | 9.4 gm/100 ml |
| hematocrit: | 28% |
| weight: | 18.0 kg (40 lb) |
| height: | 102 cm (40.5 in) |

Jenny is reported to be in good health except that according to her mother she has not been eating right. Both parents are 10% to 15% over their ideal weight. Jenny's 10- year-old brother is at his ideal weight for height and age. Both the grandmother and the great-grandmother on the maternal side have maturity-onset diabetes mellitus.

**Table 5–2** Foods Included in a Good Daily Diet (Average Amounts for Each Age)

| Food | Preschool 3–5 Years | Early Elementary 6–9 Years | Later Elementary 10–12 Years | Early Adolescence 13–15 Years |
|---|---|---|---|---|
| Milk | 2 cups | 2–3 cups | 3 cups or more | 3–4 cups or more |
| Eggs | 1 whole egg | 1 whole egg | 1 whole egg | 1 or more whole eggs |
| Meat, poultry, fish | 2 ounces (¼c) (1 sm serving) | 2–3 ounces (1 sm serving) | 3–4 ounces (1 serving) | 4 ounces or more (1 serving) |
| Dried beans, peas (also an occasional replacement for meat, poultry or fish) | 3–4 Tbsp | 4–5 Tbsp | 5–6 Tbsp | ½ cup or more |
| Potatoes (may occasionally be replaced by equal amount of enriched macaroni, spaghetti, or rice) | 3–4 Tbsp | 4–5 Tbsp | ½ cup or more | 3/4 cup or more |
| Other cooked vegetables (often a green leafy or deep yellow vegetable) | 3–4 Tbsp at 1 or more meals | 4–5 Tbsp. at 1 or more meals | 1/3 cup or more at 1 or more meals | ½ cup or more at 1 or more meals |
| Raw vegetables (lettuce, carrots, celery, etc.) | 2 or more sm pieces | ½ cup | 1/3 cup | ½ cup or more |
| Vitamin C source (Citrus fruits, tomatoes, etc.) | 1 med -sized orange or equivalent | 1 med -sized orange or equivalent | 1 med -sized orange or equivalent | 1 large orange or equivalent |
| Other fruits | 1/3 cup at 1 or more meals | ½ cup or more at 1 or more meals | ½ cup or more at 1 or more meals | 2 servings |
| Cereal, whole grain, restored or enriched | ½ cup or more | 3/4 cup or more | 1 cup or more | 1 cup or more |
| Bread, whole grain or enriched | 2 or more slices | 2 or more slices | 2 or more slices | 2 or more slices |
| Butter or fortified margarine | 1 Tbsp. | 1 Tbsp | 1 Tbsp or more | 1 Tbsp. or more |
| Sweets | 1/3 cup simple dessert at 1 or 2 meals | ½ cup simple dessert at 1 or 2 meals | ½ cup or more simple dessert at 1 or 2 meals | ½ cup or more at 1 or 2 meals |
| Vitamin D source | Enough to provide 400 I.U. of vitamin D daily | | | |

From *Foods for Growing Boys and Girls*. Battle Creek, The Kellogg Company, 1964. Used with permission of the Kellogg Company, © 1964, Battle Creek, MI.

Jenny's activity level is low. In the past six months, many of her favorite neighborhood playmates have moved. Jenny has since spent most of her time watching television and snacking. Mrs. Wilson states that she and Jenny used to go on walks fairly often, but they have "gotten out of the habit recently."

## Test Your Knowledge

1. Using the growth charts in Appendix A at the end of this module, into what percentile for height and weight does Jenny fall? (Answers are at the back of this module.)

   Height_____

   Weight_____

2. Your records indicate that Jenny's triceps skinfold is 12 mm. Using the triceps skinfold standards in Appendix B, determine the percentiles in which Jenny's triceps measure falls.

   Triceps skinfold percentage_____

3. Using the table in Appendix C, compare Jenny's hemoglobin and hematocrit levels with normals levels. How do they compare?

   Hemoglobin_____

   Hematocrit_____

**Iron deficiency is widespread in preschoolers, especially blacks. Consider multivitamin-multimineral supplementation for preschool children if you practice in a low-income state, or if a preponderance of your patients are of black, Spanish-American, or other ethnic group origin.**

The Health and Nutrition Examination Survey, conducted on individuals from 1 to 74 years old in the non-institutionalized population of the United States, used dietary intake and biochemical findings to evaluate nutritional status. Preschoolers were listed among the groups for high risk of malnutrition. Biochemical iron deficiency is prevalent in children age 1 to 5 and is not limited to low-income groups. Dietary iron intake has been found to be correspondingly low. This age group has also frequently been found to have dietary intakes below standards for vitamin A and vitamin C.[22]

Findings in the Ten-State Nutrition Survey indicate that 34.3% of black, 14% of white, and 10% of Spanish-American preschool children in low-income states were anemic. In high-income states, 21% of black, 9% of white, and 15% of Spanish-American preschoolers were anemic.[3] If you practice in a low-income state or if a preponderance of your patients are of black, Spanish-American, or other ethnic group origins, you would be well-advised to suggest a multivitamin-multimineral supplement routinely to preschool children. One daily supplement meeting the RDA will not cause toxicity and would improve the nutritional intake of at-risk, preschool children.

*Obesity is a symptom of excessive kilocalorie intake, but it is not synonymous with excessive, or even adequate, intake of all essential nutrients.* Jenny's appearance, triceps skinfold, and increased percentile weight should call your attention to her kilocalorie intake. Suspecting the possibility of nutritional imbalance, you will also want to consider carefully her intake of vitamin A and vitamin C.

**When anthropometric information and physical appearance indicate a potential nutritional imbalance, take a diet history.**

Because Jenny is above her ideal weight, you suspect some nutritional imbalance and therefore ask Mrs. Wilson what she means when she says that Jenny "does not eat right." She replies that all Jenny wants is "junk food" and that she is never hungry at mealtimes. When asked about Jenny's dietary intake for the past 24 hours, Mrs. Wilson gives the following information:

**Breakfast**
Corn puffs
Glass of milk

**Mid-morning**
Cookies
Glass of milk

**Table 5–3** Carbohydrate, Protein, Fat, and Kilocalorie Content of Various Types of Milk

| Type of Milk | Amount | Carbohydrate (gm) | Protein (gm) | Fat (gm) | Kilocalories |
|---|---|---|---|---|---|
| Whole (3.5% fat) | 8 oz. | 12 | 8 | 8 | 152 |
| | 4 oz. | 6 | 4 | 4 | 76 |
| Low-fat (2% fat) | 8 oz. | 12 | 8 | 4 | 116 |
| | 4 oz. | 6 | 4 | 2 | 58 |
| Skim (0% fat) | 8 oz. | 12 | 8 | 0 | 80 |
| | 4 oz. | 6 | 4 | 0 | 40 |

**Lunch**
Bowl of chicken noodle soup
Peanut butter and jelly sandwich
Glass of milk

**Mid-afternoon**
Cookies
Glass of milk

**Dinner**
Hamburger patty

**Bedtime**
Cookies
Glass of milk

**Portion sizes are as critical in a diet history as the kind of food eaten. Collect precise data. Interpreting a diet history without precise data can lead to serious errors.**

As given, this 24-hour recall is not very useful. If you assume what size portions are meant or use your own interpretation of what types of foods were eaten, you can easily misinterpret the actual nutrient intake. An example in Jenny's case is milk. Compare the kilocalorie differences between whole, low-fat, and skim milk in Table 5–3.

By asking questions about the amounts and types of foods Jenny ate yesterday, you learn that Jenny ate the following quantities and types of food:

**Breakfast**
½ c corn puffs
8 oz whole milk

**Mid-morning**
5 cookies, each 2½ in. diameter
8 oz whole milk

**Lunch**
½ c chicken noodle soup
1 sl bread
1½ Tbsp peanut butter
2 tsp jelly
8 oz whole milk

**Table 5–4** Nutrient Composition of a 24-Hour Diet Recall and Recommended Dietary Allowances for a 4- to 6-Year-Old Child

| Food | Amount | Calories | Protein (gm) | Fat (gm) | Carbohydrate (gm) | Calcium (mg) |
|---|---|---|---|---|---|---|
| Milk (3.5%) | 40 ounces | 780 | 42.0 | 42.0 | 58.8 | 1416 |
| Corn Puffs | ½ ounce | 60 | 1.2 | 1.0 | 12.0 | 3 |
| Chicken Noodle Soup | 4 ounces | 26 | 1.4 | 0.8 | 3.3 | 4.0 |
| Peanut Butter | 1½ teaspoon | 116 | 5.5 | 9.9 | 3.4 | 13 |
| Cracked Wheat Bread | 1 slice | 66 | 2.2 | 0.6 | 13.0 | 22 |
| Jelly | 2 teaspoons | 27 | -0- | -0- | 7.0 | 2 |
| Hamburger | 2 ounces | 131 | 16.0 | 7.0 | -0- | 7 |
| Cookies | 15 | 720.0 | 7.6 | 30.3 | 106.0 | 56 |
| Totals for Day | | 1926 | 76.0 | 91.6 | 204.0 | 1523 |
| RDA 1980 4–6 yr. old Child | | 1700 | 30.0 | * | * | 800 |

* No recommendation established.

**Mid-afternoon**
5 cookies, each 2½ in. diameter
8 oz whole milk
**Dinner**
2 oz hamburger patty
**Bedtime**
5 cookies, each 2½ in. diameter
8 oz whole milk

When Mrs. Wilson said that Jenny had a peanut butter sandwich, did you picture a sandwich with 2 slices of bread or the half sandwich she actually had?

Look at the nutrient breakdown from the 24-hour recall in Table 5–4. Compare Jenny's intake with the RDA listed at the bottom of the table.

## Test Your Knowledge

4. Looking at the nutritional analysis of Jenny's dietary intake yesterday, list the 5 nutrients which were consumed at a level lower than recommended.

1. _____
2. _____
3. _____
4. _____
5. _____

Table 5-4 (continued)

| Phosphorus (mg) | Iron (mg) | Sodium (mg) | Potassium (mg) | Vitamin A (R.E.) | Thiamin (mg) | Riboflavin (mg) | Niacin (N.E.) | Vitamin C (mg) |
|---|---|---|---|---|---|---|---|---|
| 1116 | Trace | 600 | 1728 | 336 | 0.36 | 2.04 | 1.2 | 12.0 |
| 14 | 0.9 | 159 | -0- | -0- | 0.13 | 0.03 | 0.40 | 0 |
| 15 | 0.2 | 408 | 23 | 4 | 0.01 | 0.01 | 0.30 | Trace |
| 81 | 0.4 | 121 | 134 | -0- | 0.03 | 0.02 | 3.10 | 0 |
| 32 | 0.3 | 132 | 34 | -0- | 0.03 | 0.02 | 0.33 | Trace |
| 1 | 0.2 | 2 | 8 | -0- | -0- | -0- | 0.02 | 0.4 |
| 138 | 2.1 | 29 | 335 | 3 | 0.05 | 0.14 | 3.60 | 0 |
| 245 | 1.1 | 548 | 101 | 24 | 0.05 | 0.08 | 0.60 | Trace |
| 1642 | 5.2 | 1999 | 2363 | 367 | 0.66 | 2.34 | 9.55 | 12.4 |
| 800 | 10.0 | 450–1350 | 775–2325 | 500 | 0.9 | 1.0 | 11.00 | 45 |

**Recommended dietary allowances (RDA) and minimum daily requirements (MDR) are not the same. The RDA have a built-in margin of safety, whereas the MDR do not.**

The Recommended Dietary Allowances (RDA) should not be confused with nutrient requirements. The allowances represent:

> . . . levels of intake of essential nutrients considered, in the judgment of the Committee on Dietary Allowances of the Food and Nutrition Board on the basis of available scientific knowledge, to be adequate to meet the known nutritional needs of practically all healthy persons.
>
> — National Academy of Sciences, 1980[5]

Requirements, on the other hand, are levels of nutrient intake below which deficiencies are likely to occur.

The allowances are calculated to include average requirements for each age and sex. Statistical variation is calculated so that persons with higher requirements are protected under the RDA. Thus, allowances will have a safety margin for most people. The one exception is the energy level; the energy level was set in this manner in order not to encourage excessive kilocalorie intake.

The RDA do not cover therapeutic needs or excessive requirements caused by altered metabolic states, strenuous physical activity, climate extremes, or chronic diseases. For a more thorough explanation, see the National Academy of Sciences publication "Recommended Dietary Allowances, 1980"[5] and Module 1 on the nutrient content of foods.

At one time, Minimum Daily Requirements (MDR) were widely used on food packaging to indicate the nutrient composition of foods in relation to human needs. The MDR were just that — minimum requirements. These levels were often misconstrued by the lay public to be "recommended" nutrient levels. Actually, though, the MDR are inadequate for large segments of the population.

Much of the confusion caused by minimum daily requirements has been clarified since legislation concerning nutrition labeling has been enacted. The Food and Drug Administration has set values derived from the RDA which are called United States Recommended Daily Allowances (US RDA). These are now used as nutrient labeling standards.

Because Jenny is showing biochemical and clinical evidence of inadequate intake of iron and excessive kilocalorie intake, you might assume that her requirement is not being met for iron and that her kilocalorie requirement is being exceeded.

**A 24-hour recall provides important information, but it should always be supplemented by a cross-check in which you ask the patient about the number of servings of foods typically eaten daily or weekly in the four food groups. This will help place the 24-hour recall into proper perspective and give you a much more accurate picture of how the patient typically eats on a daily basis.**

As a cross-check of Jenny's 24-hour recall, you asked Mrs. Wilson what foods Jenny typically eats daily in each of the following food groupings. Her responses are as follows:

| | |
|---|---|
| Milk | 5 to 6 glasses a day (8 ounces each) |
| Fruits | 4 to 6 ounces of orange juice most mornings; likes other fruits such as apples, oranges, bananas, and raisins, but these are not often purchased |
| Vegetables | 1 medium carrot most afternoons — does not eat other vegetables |
| Grains | ½ cup oatmeal or sugar-frosted cornflakes or corn puffs or raisin bran or Frankenberry for breakfast<br>1 or 2 slices of bread |
| Butter or margarine | 1 teaspoon per slice bread |
| Meat | 2 ounces chicken, beef, pork, or ham; likes pork and beans, cheese, nuts, and eggs, in addition to meat |

| | |
|---|---|
| Desserts | at least 1 serving of dessert each day — likes cookies, ice cream, pies, cakes, jello, custard, and pudding |

If you had not asked about these food groups, you could have missed the fact that Jenny usually has orange juice every day. Thus, her intake of vitamin C probably is not as low as it appears in Table 5–4. As you evaluate Jenny's diet more carefully, you will note a high kilocalorie intake and a vitamin and mineral intake which is adequate for the most part.

**Foods that have few nutrients, yet are high in kilocalories are those with a low nutrient density per kilocalorie ratio. Such foods should be avoided when weight reduction is desired or when children are being encouraged to "grow into" their weight.**

It is important to consider nutrient density per kilocalorie of the food Jenny eats. Jenny's high intake of cookies gives her a large number of kilocalories with proportionately few other nutrients, since the nutrient density per kilocalorie of cookies is low. Look at the nutrient density of some of the other foods that Jenny eats (see Appendix D). Carrot sticks and raisins, for instance, have a much higher nutrient per kilocalorie ratio than cookies do.

Because you know that Mr. and Mrs. Wilson are overweight, it would be wise to ask Mrs. Wilson to describe the eating pattern of the whole family. You find out that Mrs. Wilson likes to cook and bakes a lot of cookies and cakes. She says that she likes a variety of foods but that her husband does not. As an example, she explains that he will eat only two vegetables, Brussels sprouts and green beans. She admits also that she has been eating a lot of cookies and "goodies" between meals. She has been compensating for this practice, however, by using a small plate at dinner and not eating "too much." Recently she has not enjoyed cooking because "her husband is too picky, her son is too busy to eat, and Jenny is not hungry." Mrs. Wilson now adds that because Jenny "isn't eating right" she started yesterday to give her vitamins.

Mrs. Wilson has revealed a great deal about how Jenny's eating patterns have evolved. Jenny, like all other children, is influenced by how her family eats; she learns by imitation. Her nutritional problems may be a perfect stimulus to begin to improve the entire family's eating patterns. Impress on Mrs. Wilson how important her eating example is to her children. Encourage Mrs. Wilson's appreciation of a variety of foods.

Stress to Mrs. Wilson that the most effective way parents can help children improve their eating patterns is to improve their own eating patterns. The following are suggestions which you might give Mrs. Wilson in an attempt to improve the entire family's eating patterns:

1. Make mealtimes pleasant.
2. Prepare foods in ways that optimize color and texture. Prepare "pretty foods" such as carrot curls, deviled egg boats with a paper sail stuck in the top, and broccoli-tomato-cauliflower poles covered with cheese sauce. Be creative; children love to create pretty foods, too, and they will eat them after they make them — especially if the parent will eat them with the children.
3. Serve and eat a variety of foods.
4. Give children small portions.
5. Cut "hard-to-eat" foods into pieces which the child can handle.
6. Prevent a lot of before-meal snacking.
7. Feed children early in the evening before they are physically tired after a full day of play.
8. Introduce new foods often, but do not force them on an unwilling child.
9. Know what foods of strong flavor or odd texture may not be immediately accepted.

Mrs. Wilson states that Jenny "is not hungry." It is probable that Jenny is following her mother's example of snacking between meals and then not eating much for dinner. It should be remembered that it is not uncommon for preschoolers to lose their appetites in response to a slowing of growth. However, in Jenny's case, more than likely it is the high satisfaction value of her between-meal snacks that is decreasing her appetite at mealtimes.

Each snack Jenny ate yesterday added between 200 and 300 kilocalories to her intake. Her energy

intake yesterday was over 200 kilocalories in excess of the recommended allowance for her age group. If you calculate Jenny's kilocalorie allowance according to figures that allow for size differences in children, you will find the energy recommendations even lower. Table 5–5 indicates the recommended kilocalorie intake per kilogram and pound of body weight for various ages of infants and children.

**Table 5–5** Recommended Kilocalorie Intake for Infants and Children

| Age | Recommended Kilocalorie Intake | |
|---|---|---|
| | kcal/kg | kcal/lb |
| Birth–6 months | 117 | 53 |
| 7 months to 1 year | 108 | 50 |
| 13 to 36 months | 100 | 45 |
| 4 to 6 years | 90 | 41 |
| 7 to 10 years | 80 | 36 |

Recommended Dietary Allowances. Washington, D.C., National Academy of Sciences, 1980.

## Test Your Knowledge

5. Using Table 5–5, calculate the recommended energy allowance for Jenny. You should remember that Jenny is a 4-year-old who currently weighs 18 kilograms (40 pounds).
   Recommended energy allowance_____

**Overweight parents tend to have overweight children. Overweight children frequently become overweight adults with increased risk of chronic disorders such as diabetes mellitus, arthritis, gallbladder disease, and cardiovascular disease.**

Jenny is following her parents' example of excessive kilocalorie intake. Overweight adults tend to nurture obesity in their children; the problems are both hereditary and environmental. The risk of obesity in children with parents of normal weight is 7%. When one parent is obese, there is a 40% chance that the children will be obese. When both parents are obese, there is an 80% chance that the children will be, also.[15] If a child in a family of lean individuals is obese, the onset of obesity can often be traced to some form of psychological trauma, such as the loss of a parent, surgery, or physical injury.[9]

Health problems begin at an early age in obese children. Fat infants appear to have more frequent and more severe respiratory infections than do non-obese infants; obese children are more likely to have orthopedic problems of the legs than are non-obese children. Decreased exercise tolerance is also common in these children.

A recent study by Zack indicated that childhood obesity contributes significantly to adolescent obesity.[24] Therefore, it is advisable for physicians to employ relative weight and height tables, growth charts, and measurements of skinfold thickness to assess the degree of adiposity from childhood into adolescence and adulthood.

Obesity during childhood appears to predestine the child to adult obesity and to related complications, including the chronic disorders of diabetes, cardiovascular disease, gallbladder disease, and arthritis.[4] In addition, the psychological impact of juvenile-onset obesity may have lasting effects upon the individual's life.[9]

**Obesity is characterized by excessive fatness. *Hypertrophic* obese people have a normal number of over-filled adipose cells whereas *hyperplastic* obese people possess an excess number of adipose cells. Obese children tend to develop hyperplastic obesity while adults becoming obese as adults tend to have hypertrophic obesity.**

The "fat-cell hypothesis," first proposed by Hirsch in 1966,[10] suggests that if excess kilocalories are provided during the period of hyperplasia of adipose cells (infancy, adolescence), the body responds by increasing the number of adipose cells in addition to increasing their size. Once generated, the number of adipose cells remains constant throughout life. Successful weight loss in hyperplastic people results in decreased adipose cell size. It has been theorized that for the hyperplastic person, the obese state is the normal one. The "fat-cell hypothesis" is not without controversy.

An obese person's adipose tissue has metabolic characteristics that differentiate it from adipose tissue of the non-obese. In vitro studies of non-obese and obese adipose tissue demonstrate diminished response to the lipolytic effect of the hormone epinephrine.[14] In a review of information available on adipocytes of obese patients, Angel stated that adipocytes from the obese person have a greater propensity for replication and lipid storage than do adipocytes from a non-obese person.[1] It has been suggested that chronic overnutrition triggers, by means of substrate flow or tropic hormone excess, the replicative and anabolic potential of adipocyte precursors to differentiate and store lipid.

There is some indication in the literature that the hypertrophic adult obesity and the hyperplastic obesity that begins in childhood may not be so easily separated. There are periods of life during which obesity seems to be hyperplastic in nature.

But it appears that once all adipocytes are filled with a certain amount of lipids, preadipocytes may form to take over the excess. This probably occurs at any time that extreme excess kilocalorie intake occurs.

Jenny is at an age where increasing adipocyte-numbers is likely. Thus, it is very important to curb habits now that could lead to further overweight.

**Growing children should be allowed to "grow into" their weight rather than go on a severely restricted weight-loss diet. Increasing energy output by increasing activity is important.**

Once present, excess body fat is notoriously hard to lose. Traditional dieting measures such as those used in the adult population should not be used in treating childhood obesity. Results of studies done where mild or severe kilocalorie restriction has been used with obese children indicate a high drop-out rate from therapy. Most patients lose only a small amount of weight (less than 10% lose more than 10 pounds).

Because of the side effects and potential for abuse, use of drugs to treat childhood obesity should never be recommended. In the first 2 to 4 years of life, kilocalorie restriction should be avoided.

A growing child like Jenny should not be placed on a markedly restricted diet for weight loss. The fact that growing takes energy works in favor of improving her weight status. If kilocalories are severely restricted, her growth and development might be compromised. Generally, the recommended allowance for a child from 4 to 6 years is about 90 kilocalories per kilogram. At her present weight this allowance would be approximately 1,620 kilocalories. This level would probably maintain her weight. Rather than restricting her intake, it would be wiser to increase her energy output by increasing her level of activity. More activity would probably also take her away from snacks. Her appetite at mealtime might increase as she decreases her between-meal snacks.

## Test Your Knowledge

6. How would you suggest that Jenny's activity level be increased?

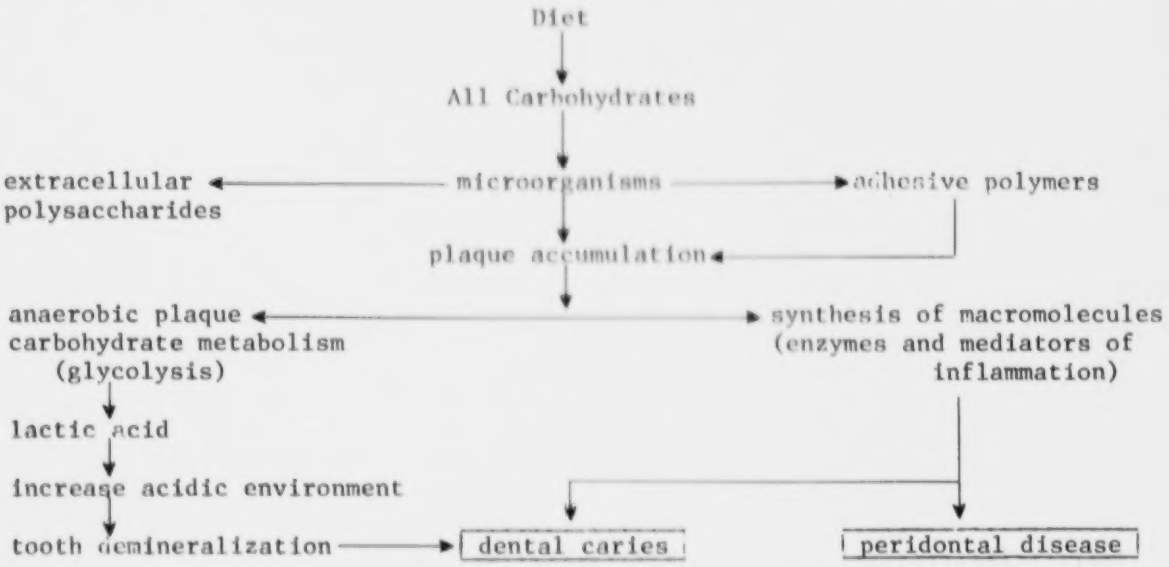
**Carbohydrate-containing foods, especially foods that stick to the tooth surface, contribute to dental caries and peridontal disease by creating an optimal medium for growth of microorganisms on teeth which cause tooth demineralization and breakdown of tooth-bone structure.**

Jenny's intake of sugar is fairly high because of all her between meal snacks. It would be wise to cut down her intake of carbohydrates for two reasons. First, many of the foods that are high in carbohydrate have a low nutrient per kilocalorie density. Second, high carbohydrate intake, especially when teeth are not brushed after eating, contributes to the development of dental caries.

Carbohydrates (sucrose, lactose, glucose, fructose, maltose, and starch) are critical in dental cariogenicity and the development of peridontal disease. Carbohydrate is used as a fermentable energy source by microorganisms on teeth which produce lactic acid through glycolysis. The acidity caused by the lactic acid solubilizes calcium from the tooth and demineralizes tooth structure. In addition, carbohydrate is chemically changed by the bacteria into extracellular adhesive polymers which allow for plaque formation, adhesion to teeth, and further fermentation of carbohydrate. Carbohydrate is stored extracellularly in the plaque and intracellularly within the microorganisms, allowing the microorganisms to survive long periods of nutritional deprivation. Microorganisms present in plaque produce macromolecules including enzymes and mediators of inflammation that further break down tooth and tooth-bone structure. See Brown[2] for an in depth discussion of the schematic illustration (see Figure 5–1) on the role of carbohydrates in dental disease.

The cariogenicity of carbohydrate is related to the length of time the carbohydrate is available to oral flora. Sticky carbohydrates tend to be more cariogenic than non-sticky carbohydrates because they adhere to the teeth longer. Complex carbohydrates tend to be slightly less cariogenic than sucrose and monosaccharides. All carbohydrates,

**Figure 5–1** Schematic Illustration of the Role of Carbohydrates in Dental Disease




Adapted from Brown, A. T.: "The Role of Dietary Carbohydrates in Plaque Formation and Oral Disease." *Present Knowledge in Nutrition*, 4th ed., Washington, DC, The Nutrition Foundation, Inc., 1976.

however, can be used as a metabolizable source of energy for the microorganisms. Therefore, cleaning teeth regularly is important to prevent dental caries. Fluoride helps prevent dental caries by entering the hydroxyapatite structure replacing a hydroxyl group, resulting in lower mineral solubility, greater crystal size, and a more perfect structure, thereby making the tooth more resistant to demineralization. A 50% to 70% reduction of dental caries has been reported as a result of water fluoridation.[11]

You note that Mrs. Wilson stated she began giving Jenny multivitamins recently. This is information that you should pursue with Mrs. Wilson. Therefore, you ask her what kind of vitamins she gives Jenny. She reveals that she gives three different vitamin pills recommended in health food magazines — vitamins A, C, and E.

Mrs. Wilson's comments should alarm you! Health food magazines often print unsound claims about foods and nutrients. Their content is commonly erroneous and misleading, and, if followed, can lead, in many cases, to serious nutritional problems. In such health food magazines, it is frequently recommended that persons consume megadoses of fat-soluble and water-soluble vitamins.

**Massive quantities of any vitamin are not wise. All the vitamins in amounts needed are available from a varied diet. If any vitamin supplement is taken, it should be a multiple vitamin supplement providing no more than the RDA. Vitamin A toxicity can be manifested acutely by central nervous system symptoms and chronically by skin disorders.**

Vitamin A toxicity can be acute or chronic. The symptoms of acute vitamin A poisoning include drowsiness, irritability, headache, vomiting, and an elevated serum vitamin A level. Chronic hypervitaminosis A symptomology includes dermatosis, alopecia, anorexia, nausea, demineralization of bone, enlarged liver, and enlarged spleen. Patterns of symptomology vary with the age of the individual. Infants and children are more quickly and dramatically affected than adults. Hydrocephalus may occur in infants with hypervitaminosis A. Another manifestation of toxicity is increased intracranial pressure, also called pseudotumor cerebri.

Hayes and Hegsted reviewed reports from studies done in the late 1960s which suggested chronic toxic doses of vitamin A for infants less than a year to be from 18,000 to 60,000 IU daily.[8] For the 1- to 5-year-old group, the chronic toxic level was estimated to be from 80,000 to 500,000 IU daily. These levels are by no means conclusive. It is recommended that daily intake of vitamin A should never exceed 5 to 10 times the RDA unless there is careful supervision by a qualified physician or nutritionist.[16]

Toxicity symptoms of vitamin C in children receiving 1,000 milligrams daily for 17 weeks include abdominal symptoms such as diarrhea, nausea, gastroenteritis with flatus, and anal irritation. Other symptoms of high intakes of vitamin C include oxalate stone formation, possible copper deficiency, and decreased anticoagulant effect of heparin and dicumarol-type anticoagulants. Hemolysis of erythrocytes, particularly in people who have depressed mechanisms for handling oxidant stress such as occurs in glucose-6-phosphate dehydrogenase deficiency also has been observed. Deficiency of vitamin $B_{12}$ in people who ingest marginal amounts of vitamin $B_{12}$ may occur in persons who consume large amounts of ascorbic acid. False negative tests for test-tape measures of urine glucose in diabetic patients may also occur with ingestion of large amounts of vitamin C.

Although toxicity symptoms of vitamin E have not been identified, there are many reasons to question the prevailing concept that large amounts of vitamin E can be ingested safely over prolonged periods of time. Ingestion of large amounts of vitamin E may unbalance the ratio between vitamin E and vitamin K and may, thereby, lead to impairment of blood coagulation.

Appendix E includes samples of vitamins offered at health food stores. Those which are boxed are the vitamins given to Jenny. Fortunately, the levels that Mrs. Wilson was giving Jenny were not toxic, although they were in excess of her needs. If Jenny is encouraged to eat a better variety of food, she probably will not have need for additional vitamins. *Vitamins should never be substituted for food and good eating.*

## Test Your Knowledge

7. List the actions you might suggest to help Mrs. Wilson and Jenny improve Jenny's nutritional intake.

   1. _____
   2. _____
   3. _____
   4. _____
   5. _____
   6. _____
   7. _____
   8. _____
   9. _____
   10. _____

8. Select 2 foods from Jenny's diet history that would increase her intake of iron.

   1. _____
   2. _____

9. What 2 changes in Jenny's milk intake would you recommend?

   1. _____
   2. _____

10. What kilocalorie level would you select for Jenny to permit growth and development, yet reduce adiposity?

11. What 3 nutrients are most often found to be inadequate in the diet of the preschooler?

    1. _____

    2. _____

    3. _____

12. Explain the role of dietary carbohydrate in the development of dental caries in a way Mrs. Wilson would understand.

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## Resources for the Patient

Deutsch, R.M.: *The New Nuts Among the Berries.* Palo Alto, CA, Bull Publishing, 1977.
Book about "nutrition nonsense." A record of food faddists' beliefs and influences.

Deutsch, R.M.: *Family Guide to Better Food and Better Health.* Des Moines, IA, Meredith, 1971.
A general, basic book on nutrition in a very readable form the lay public will enjoy.

McWilliams, M.: *Nutrition for the Growing Years.* 2nd ed. New York, Wiley, 1975.
Covers nutrition basics and problems often faced by health professionals in dealing with patients in the growing years. Practical application.

Lansky, Vicky: *Feed Me, I'm Yours.* Bantam, 1974.
Good nutrition hints for the lay reader.

## Answers

1. Height — 50th percentile
   Weight — 75th percentile
   It would be important to know in what percentile Jenny was during earlier visits to your office. Consider also what Jenny's mother's and father's heights and weights are, as well. This information is important to interpret correctly Jenny's height and weight percentile.

   In your records, you find that Jenny has consistently fallen in the 50th percentile for both height and weight throughout her first 3 years. You know that Mr. and Mrs. Wilson are of average frame and height. You, therefore, can consider that Jenny's final height will most likely be about the average of her parents' heights.

2. Triceps skinfold percentage — 85%

3. Both hemoglobin and hematocrit are deficient.

| Parameter | Jenny's values | Acceptable values |
|---|---|---|
| Hemoglobin | 9.4 gm % | $\geq$ 11.0 gm % |
| Hematocrit | 28% | $\geq$ 34% |

4. Iron
   Vitamin A
   Thiamin
   Niacin
   Vitamin C

5. Recommended energy allowance from Table 5–5 is *1,620 to 1,640 kilocalories*. Recommended energy allowance from the RDA (Table 3–5) is *1,700 kilocalories*.

6. Mrs. Wilson mentioned that she and Jenny used to take walks. Encouraging this activity would likely succeed since it recently has been part of their daily routine. It would also help Jenny see potential playmates in her own neighborhood. Community facilities might be available for swimming lessons or other organized physical activities.

7. There are many ways to approach Jenny's nutritional problems. Here are some suggestions:
   1. Stop Mrs. Wilson's use of vitamin pills, unless she will switch to a once-daily, multiple vitamin.
   2. Encourage Mrs. Wilson to have a larger variety of foods and meals, especially fruits and vegetables.
   3. Encourage Mrs. Wilson to limit buying and making high-kilocalorie desserts.
   4. Encourage the use of foods high in iron.
   5. Encourage the use of foods high in vitamin C to enhance absorption of iron.
   6. Encourage Mrs. Wilson to help Jenny become more physically active. It may help Jenny forget about food and increase her energy output.
   7. Encourage Mrs. Wilson to cut down the amount of milk Jenny drinks.
   8. Encourage Mrs. Wilson to use 2% milk for kilocalorie reduction.
   9. Suggest snack foods high in vitamin A and iron.
   10. Encourage Mrs. Wilson to cut down her own kilocalorie intake; let Jenny know that she enjoys eating vegetables and fruits.

8. Eggs and raisins are good sources of iron which Jenny usually eats.

9. 1. Cut down the total amount of milk Jenny consumes to 4 cups daily.
   2. Substitute skim or low-fat milk for whole milk to decrease the kilocalorie content of Jenny's diet.

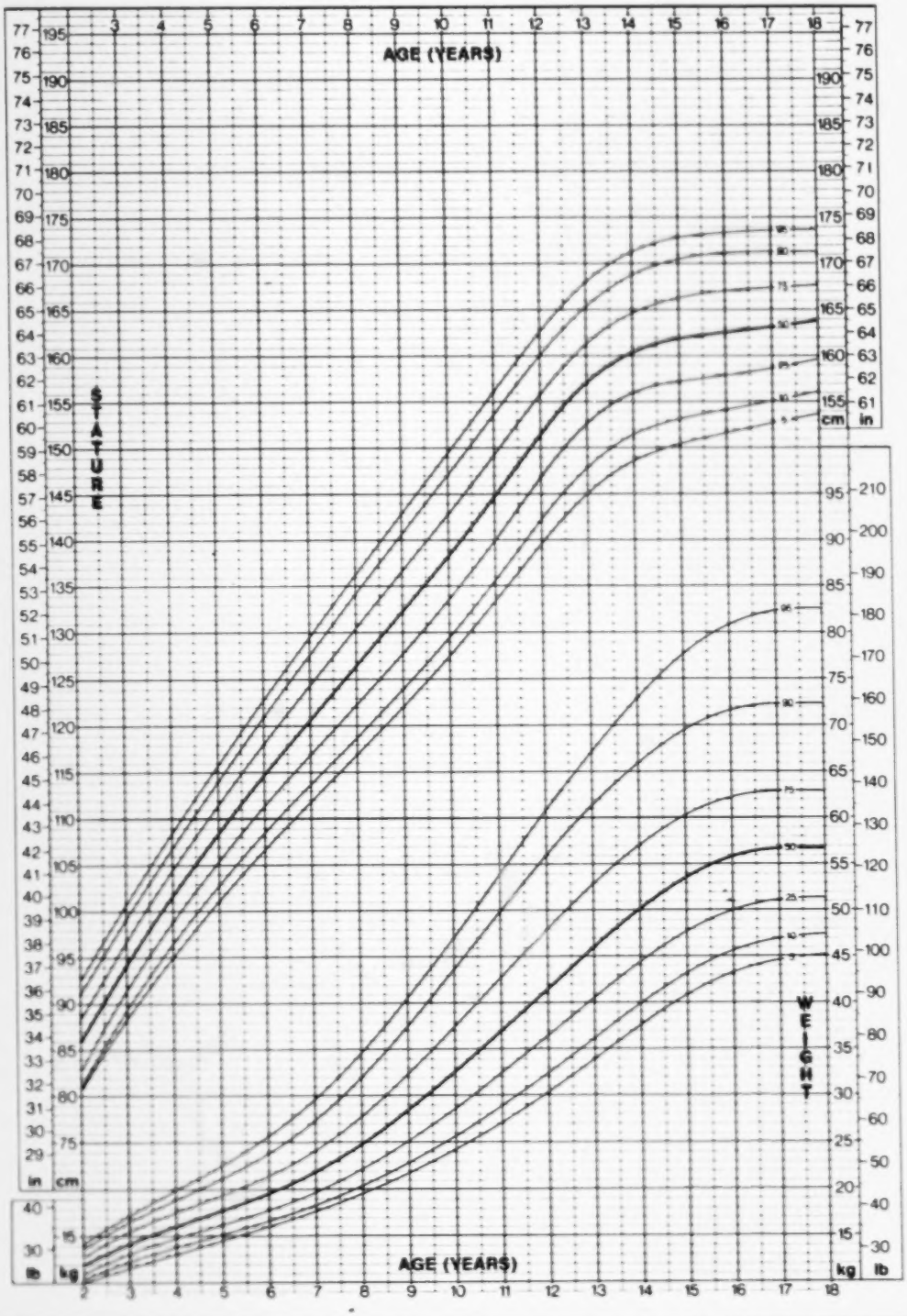
10. Considering an allowance of 90 kilocalories/kilogram for the 4- to 6-year-old child, calculations for an appropriate allowance would lead to an answer somewhere between 1,600 and 1,700 kilocalories. Because there are many simple modifications that can be made in Jenny's diet in order to reduce unnecessary kilocalories, a specific kilocalorie level is probably not necessary at this point. If you can convince Mrs. Wilson to increase vegetables and fruits and cut down on milk and/or milk fat and sweet desserts, chances are good that Jenny will lose her excess adiposity and continue to grow normally. If her eating habits have not improved by the next visit, a planned kilocalorie diet may become necessary.

11. Vitamin A
    Vitamin C
    Iron

12. You should have included the following concepts in your answer:
    1. Carbohydrates allow bacteria always present in the mouth to make substances that break down the structure of the tooth and bone, causing dental caries and peridontal disease.
    2. Sticky carbohydrates adhere to the teeth and allow bacteria a long time to cause dental caries.
    3. You could also add the following:
       a. brushing and flossing teeth after eating is wise.
       b. fluoride helps make the tooth structure stronger; use of fluoride-containing toothpaste is wise.
       c. Jenny should have regular dental checkups.

## Appendix A–1

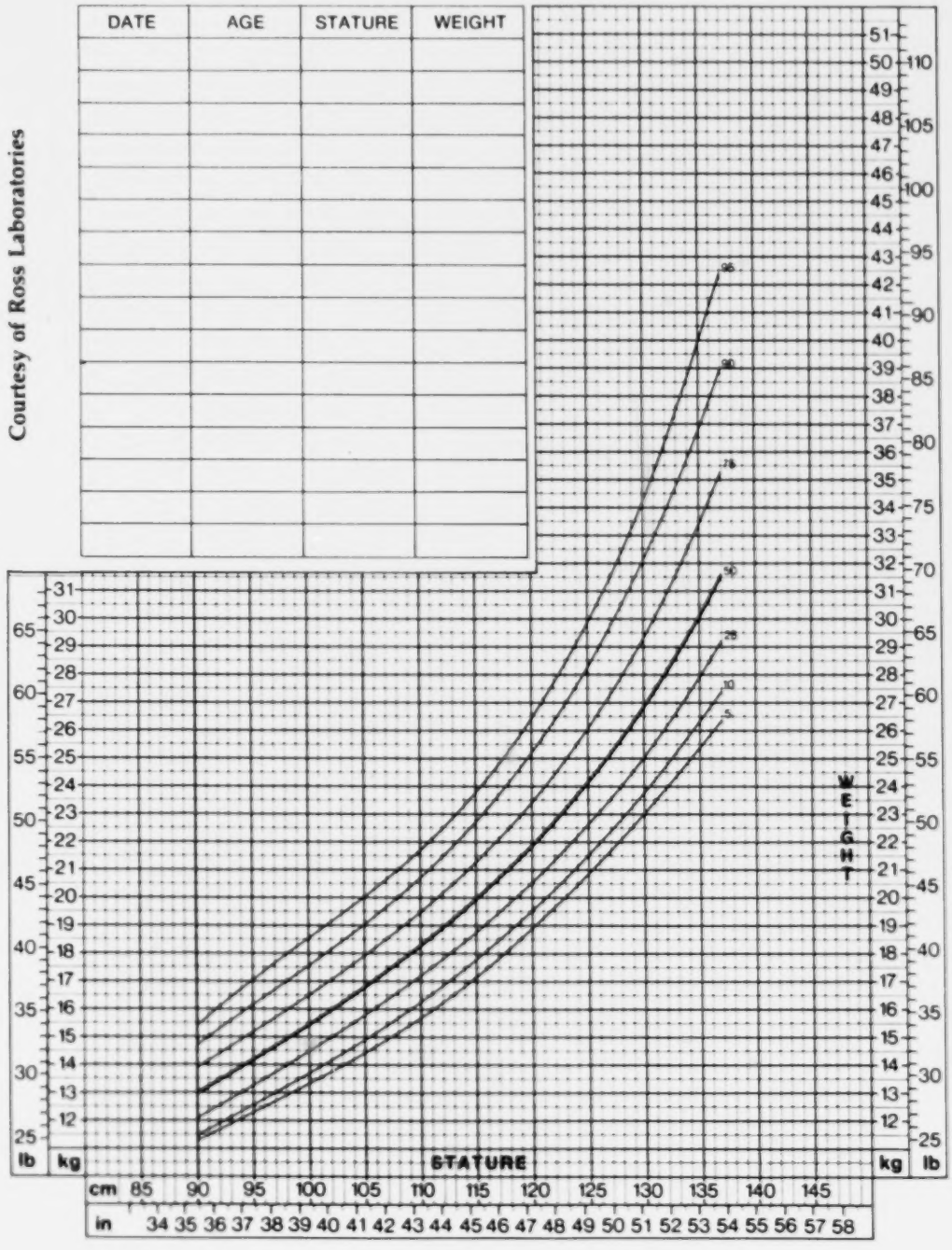
**Figure 5–2** Growth Chart — Girls: 2 to 18 Years Physical Growth NCHS Percentiles




Courtesy of Ross Laboratories

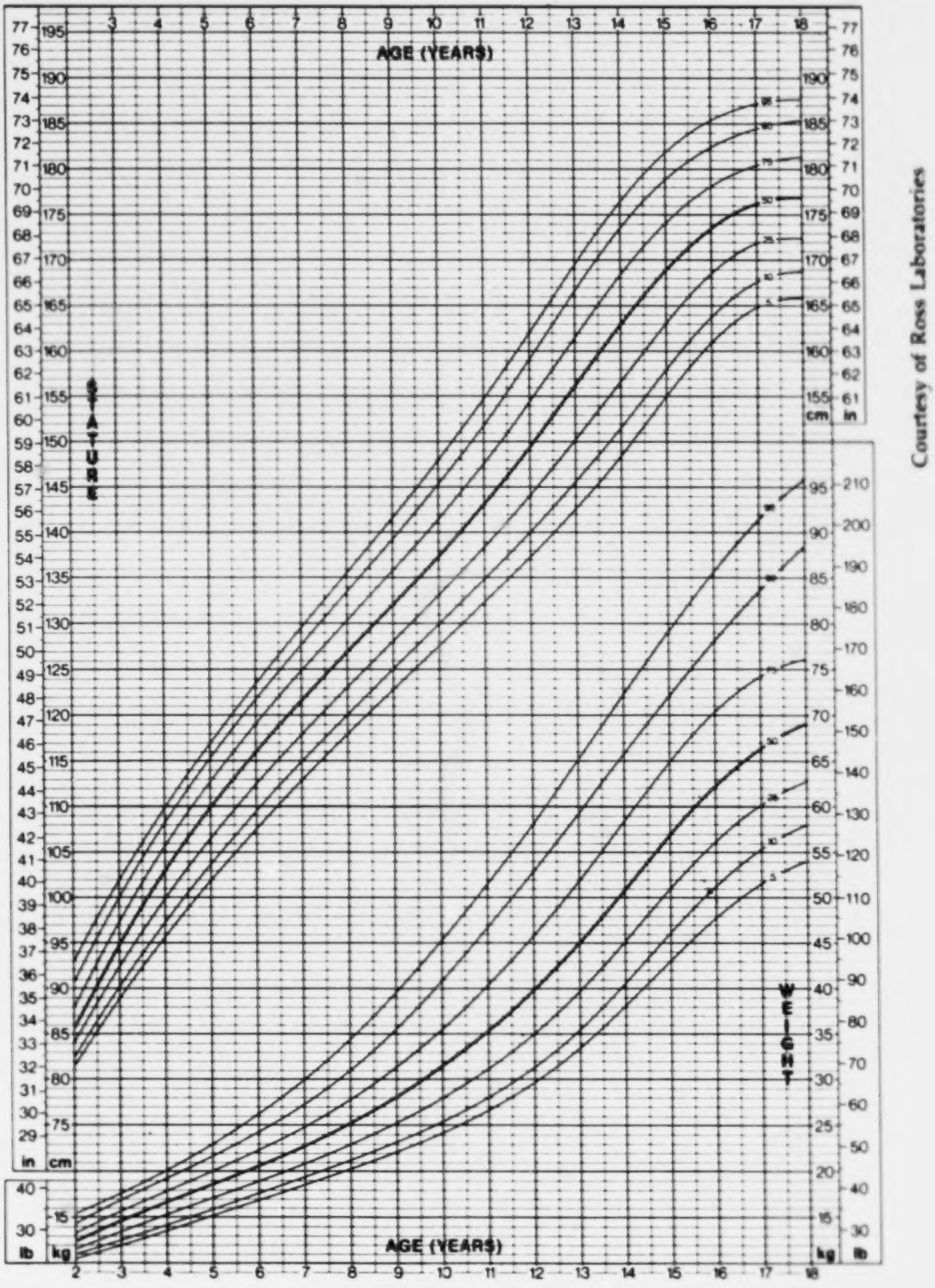
## Appendix A–2

**Figure 5–3** Growth Chart — Girls: Prepubescent Physical Growth NCHS Percentiles



## Appendix A–3

**Figure 5–4** Growth Chart — Boys: 2 to 18 years Physical Growth NCHS Percentiles

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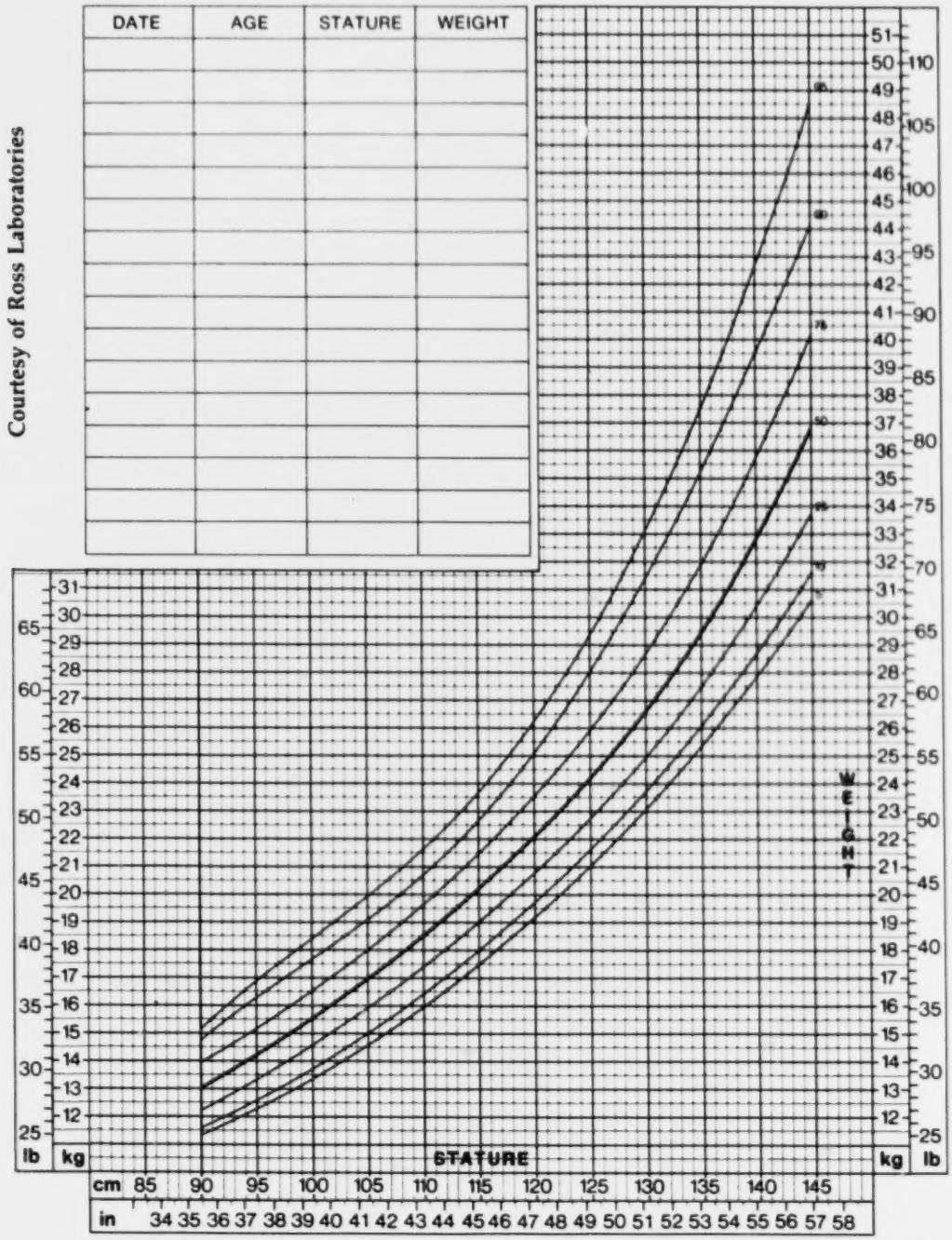
## Appendix A–4

**Figure 5–5** Growth Chart — Boys: Prepubescent Physical Growth NCHS Percentiles




Figures 5–2 through 5–5 adapted from Hamill, P.V.V., Drizd, T.A., Johnson, C.L., Reed, R.B., Roche, A.F., Moore, W.M.: "Physical Growth: National Center for Health Statistics Percentiles," *American Journal of Clinical Nutrition*, 32:607-629, 1979. Data from the National Center for Health Statistics (NCHS), Hyattsville, MD.

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## Appendix B

**Table 5–6** Percentiles for Triceps Skinfolds for Whites of the Ten-State Nutrition Survey of 1968-1970

| Age Group (years) | Triceps skinfold percentiles (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Males | | | | | Females | | | | |
| | 5th | 15th | 50th | 85th | 95th | 5th | 15th | 50th | 85th | 95th |
| 0.0–0.4 | 4 | 5 | 8 | 12 | 15 | 4 | 5 | 8 | 12 | 13 |
| 0.5–1.4 | 5 | 7 | 9 | 13 | 15 | 6 | 7 | 9 | 12 | 15 |
| 1.5–2.4 | 5 | 7 | 10 | 13 | 14 | 6 | 7 | 10 | 13 | 15 |
| 2.5–3.4 | 6 | 7 | 9 | 12 | 14 | 6 | 7 | 10 | 12 | 14 |
| 3.5–4.4 | 5 | 6 | 9 | 12 | 14 | 5 | 7 | 10 | 12 | 14 |
| 4.5–5.4 | 5 | 6 | 8 | 12 | 16 | 6 | 7 | 10 | 13 | 16 |
| 5.5–6.4 | 5 | 6 | 8 | 11 | 15 | 6 | 7 | 10 | 12 | 15 |
| 6.5–7.4 | 4 | 6 | 8 | 11 | 14 | 6 | 7 | 10 | 13 | 17 |
| 7.5–8.4 | 5 | 6 | 8 | 12 | 17 | 6 | 7 | 10 | 15 | 19 |
| 8.5–9.4 | 5 | 6 | 9 | 14 | 19 | 6 | 7 | 11 | 17 | 24 |
| 9.5–10.4 | 5 | 6 | 10 | 16 | 22 | 6 | 8 | 12 | 19 | 24 |
| 10.5–11.4 | 6 | 7 | 10 | 17 | 25 | 7 | 8 | 12 | 20 | 29 |
| 11.5–12.4 | 5 | 7 | 11 | 19 | 26 | 6 | 9 | 13 | 20 | 25 |
| 12.5–13.4 | 5 | 6 | 10 | 18 | 25 | 7 | 9 | 14 | 23 | 30 |
| 13.5–14.4 | 5 | 6 | 10 | 17 | 22 | 8 | 10 | 15 | 22 | 28 |
| 14.5–15.4 | 4 | 6 | 9 | 19 | 26 | 8 | 11 | 16 | 24 | 30 |
| 15.5–16.4 | 4 | 5 | 9 | 20 | 27 | 8 | 10 | 15 | 23 | 27 |
| 16.5–17.4 | 4 | 5 | 8 | 14 | 20 | 9 | 12 | 16 | 26 | 31 |

Adapted from Frisancho, A.R.: "Triceps Skinfold and Upper Arm Muscle Size Norms for Assessment of Nutritional Status." *American Journal of Clinical Nutrition*, 27:1052, 1974.

## Appendix C

**Table 5–7** Historical Development of the Ten-State Nutrition Survey 1968-1970

### Guidelines for Classification and Interpretation of Group Blood and Urine Data

| Determination | Classification Category: Less than acceptable — Deficient | Less than acceptable — Low | Acceptable |
|---|---|---|---|
| Hemoglobin, g/100 ml | | | |
| 6-23 months | < 9.0 | 9.0- 9.9 | ≥ 10.0 |
| 2- 5 years | < 10 | 10.0-10.9 | ≥ 11.0 |
| 6-12 years | < 10 | 10.0-11.4 | ≥ 11.5 |
| 13-16 years, male | < 12 | 12.0-12.9 | ≥ 13.0 |
| 13-16 years, female | < 10 | 10.0-11.4 | ≥ 11.5 |
| >16 years, male | < 12 | 12.0-13.9 | ≥ 14.0 |
| >16 years, female | < 10 | 10.0-11.9 | ≥ 12.0 |
| Pregnant, 2nd trimester | < 9.5 | 9.5-10.9 | ≥ 11.0 |
| Pregnant, 3rd trimester | < 9.0 | 9.0-10.4 | ≥ 10.5 |
| Hematocrit, % | | | |
| 6-23 months | < 28 | 28-30 | ≥ 31 |
| 2- 5 years | < 30 | 30-33 | ≥ 34 |
| 6-12 years | < 30 | 30-35 | ≥ 36 |
| 13-16 years, male | < 37 | 37-39 | ≥ 40 |
| 13-16 years, female | < 31 | 31-35 | ≥ 36 |
| >16 years, male | < 37 | 37-43 | ≥ 44 |
| >16 years, female | < 31 | 31-37 | ≥ 38 |
| Pregnant, 2nd trimester | < 30 | 30-34 | ≥ 35 |
| Pregnant, 3rd trimester | < 30 | 30-32 | ≥ 33 |

Adapted from Ten-State Nutrition Survey, 1968-1970. I. Historical Development. II. Demographic Data. U.S.D.H.E.W., Health Services and Mental Health Administration, p. I-115.

## Appendix D

**Table 5–8** Nutrient Breakdown of Some of the Foods Jenny Eats

| Food | Amount | Kilocalories | Protein (gm) | Fat (gm) | Carbohydrate (gm) | Calcium (mg) | Phosphorus (mg) | Iron (mg) | Sodium (mg) | Potassium (mg) | Vitamin A (R.E.) | Thiamin (mg) | Riboflavin (mg) | Niacin (N.E.) | Vitamin C (mg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carrots | 1 medium raw | 42 | 1.1 | 0.2 | 9.7 | 37 | 36 | 0.7 | 47 | 341 | 11,000 | 0.06 | 0.05 | 0.6 | 8 |
| Oatmeal | 1/2 cup | 55 | 2.0 | 1.0 | 9.7 | 9 | 57 | 0.6 | 218 | 61 | 0 | 0.08 | 0.02 | 0.1 | 0 |
| Orange juice | 1/2 cup | 54 | 0.8 | 0.1 | 12.8 | 11 | 19 | 0.1 | 1 | 223 | 240 | 0.11 | 0.01 | 0.4 | 54 |
| Raisins | 3½ ounces | 289 | 2.5 | 0.2 | 77.4 | 62 | 101 | 3.5 | 27 | 763 | 20 | 0.11 | 0.08 | 0.5 | 1 |
| Eggs | One | 81 | 6.5 | 5.8 | 0.5 | 27 | 103 | 1.2 | 61 | 65 | 590 | 0.05 | 0.14 | 0.05 | 0 |
| Cheese, Cheddar | 1 ounce | 133 | 8.3 | 11.0 | 0.7 | 250 | 159 | 0.3 | 233 | 27 | 437 | 0.01 | 0.15 | 0.03 | 0 |
| Custard | 1/2 cup | 115 | 5.4 | 5.5 | 11.1 | 112 | 117 | 0.4 | 79 | 146 | 350 | 0.04 | 0.19 | 0.1 | Trace |

## Appendix E

**Table 5–9** Sample Listing of Vitamin Supplements Typically Found in Health Food Stores

Vitamin A

Straight vitamin A concentrate in tasteless, odorless capsules is a convenient way to get the full benefits of fish liver oils. Available in transparent, uncolored, 10,000 I.U. and 25,000 I.U. capsules in natural oil form. Also available in emulsified form.

10,000 I.U.
Formula 101A
Sizes: 100, 250/Natural Oil Form Capsules

10,000 I.U.
Formula 104A
Sizes: 100, 250/Emulsified Oil Form Capsules

25,000 I.U.
Formula 208
Sizes: 100, 250/Natural Oil Form Capsules

Vitamin C with Rose Hips

Offers three high-potency vitamin C formulas containing rose hips in easy-to-swallow capsule-shaped tablets. Vegetable coated to protect potency and freshness.

500 mg (half gram)
Formula 256
Sizes: 100, 250/Tablets

600 mg.
Formula 280A
Sizes: 100, 250/Tablets

1,000 mg. (one gram)
Formula 257
Sizes: 100, 250/Tablets

Vitamin C-Complex with Rose Hips and Bioflavonoids

Each tablet is sealed with a vegetable coating to protect purity and freshness.

Formula 275
Sizes: 100, 250/Tablets

Each tablet provides:
Vitamin C with Rose Hips...200 mg
Plus the following: Lemon Bioflavonoid Complex 200 mg
Hesperidin Complex 50 mg
Rutin 25 mg

Vitamin C
Ascorbic Acid

Ascorbic acid is the economical vitamin C supplement derived from corn.

Tablets
500 mg
Formula 273A
Sizes: 100, 250, 500

Powder
4,000 mg (potency per teaspoon)
Formula 278
Sizes: 125 grams (4.38 oz)
250 grams (8.75 oz)

Natural Vitamin E Mixed Tocopherols
d-Alpha Tocopherol

The full spectrum of vitamin E activity, derived from natural vegetable oil in hermetically-sealed capsules.

100 I.U.*
Formula 153
Sizes: 100, 250 Capsules

200 I.U.*
Formula 155
Sizes: 50, 100, 250/Capsules

Table 5-9 (continued)

Natural Vitamin E Mixed Tocopherols (continued)

300 I.U.*
Formula 156
Sizes: 50, 100, 250/Capsules

400 I.U.*
Formula 157
Sizes: 50, 100, 250/Capsules

*Potency claimed for "d-Alpha" tocopherol only; also contains d-Beta, d-Gamma and d-Delta tocopherols.

Emulsified Vitamin E

Natural Vitamin E (mixed tocopherols) are emulsified with apple pectin. Emulsifying breaks oil globules into tiny particles so that even those who experience difficulty digesting oils can receive the benefits of natural vitamin E in its oil form. Available in two potencies, in transparent, uncolored capsules.

100 I.U.*
Formula 152
Sizes: 100, 250/Capsules

200 I.U.
Formula 154A
Sizes: 50, 100, 250/Capsules

*Potency claimed for "d-Alpha" tocopherol only; also contains d-Beta, d-Gamma, and d-Delta tocopherols.

Natural Vitamin E
d-Alpha Tocopheryl Acetate

This vitamin E is derived from natural vegetable oils. Hermetically-sealed in capsules for freshness.

Natural Vitamin E (continued)

100 I.U.
Formula 159
Sizes: 100, 250/Capsules

200 I.U.
Formula 162
Sizes: 100, 250/Capsules

300 I.U.
Formula 163
Sizes: 50, 100, 250/Capsules

400 I.U.
Formula 164
Sizes: 50, 100, 250, 500/Capsules

500 I.U.
Formula 165
Sizes: 50, 100, 250, 500/Capsules

600 I.U.
Formula 166
Sizes: 30, 100/Capsules

800 I.U.
Formula 168
Sizes: 30, 100/Capsules

## Some Abbrevations Used in the Nutrition in Primary Care Series

| | |
|---|---|
| ATP | adenosine triphosphate |
| c | cup |
| cc | cubic centimeter |
| CNS | central nervous system |
| FDA | Food and Drug Administration |
| gm | gram |
| IBW | ideal body weight |
| IU | International Units |
| kcal | kilocalorie |
| kg | kilogram |
| lb | pound |
| lg | large |
| MCV | mean corpuscular volume |
| MDR | minimum daily requirement |
| med | medium |
| mEq | milliequivalent |
| mg | milligram |
| MJ | megajoule |
| ml | milliliter |
| oz | ounce |
| RDA | Recommended Dietary Allowances |
| RE | retinol equivalents |
| sl | slice |
| sm | small |
| Tbsp | Tablespoon |
| TPN | total parenteral nutrition |
| tsp | teaspoon |
| USDA | United States Department of Agriculture |